

File and Directory Permissions Explained

What You Will Learn

- Symbolic permissions
- Numeric / octal permissions
- File versus directory permissions
- Changing permissions
- Working with groups
- File creation mask

Permissions

```
$ ls -l
```

```
-rw-rw-r-- 1 jason users 10400 Sep 27 08:52 sales.data
```

Symbol

Type

-

Regular file

d

Directory

l

Symbolic link

Permissions

```
$ ls -l
```

```
-rw-rw-r-- 1 jason users 10400 Sep 27 08:52 sales.data
```

Symbol	Permission
r	Read
w	Write
x	Execute

Permissions - Files vs Directories

Permission	File	Directory
Read (r)	Allows a file to be read.	Allows file names in the directory to be read.
Write (w)	Allows a file to be modified.	Allows entries to be modified within the directory.
Execute (x)	Allows the execution of a file.	Allows access to contents and metadata for entries.

Permission Categories

Symbol	Category
u	User
g	Group
o	Other
a	All

Groups

- Every user is in at least one group.
- Users can belong to many groups.
- Groups are used to organize users.
- The `groups` command displays a user's groups.
- You can also use `id -Gn`.

```
[jason@linuxsvr ~]$ groups
```

```
jason sales
```

```
[jason@linuxsvr ~]$ id -Gn
```

```
jason sales
```

```
[jason@linuxsvr ~]$ groups pat
```

```
pat : finance newyork
```

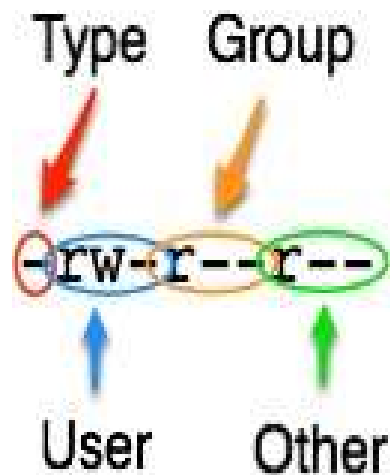
```
[jason@linuxsvr ~]$ groups adminuser
```

```
adminuser : adminuser
```

```
[jason@linuxsvr ~]$
```


Secret Decoder Ring

Type Group

The diagram shows the first part of a file listing: '-rw-r--r--'. Each character is circled and has an arrow pointing to a label. The first character '-' is circled in red with a red arrow pointing to 'Type'. The second character 'r' is circled in blue with a blue arrow pointing to 'User'. The third character 'w' is circled in blue with a blue arrow pointing to 'User'. The fourth character '-' is circled in blue with a blue arrow pointing to 'User'. The fifth character 'r' is circled in orange with an orange arrow pointing to 'Group'. The sixth character '-' is circled in orange with an orange arrow pointing to 'Group'. The seventh character 'r' is circled in green with a green arrow pointing to 'Other'. The eighth character '-' is circled in green with a green arrow pointing to 'Other'.

~~-~~rw-r--r-- 1 bob users 10400 Sep 27 08:52 sales.data

User Other

Changing Permissions

Item	Meaning
chmod	Change mode command
ugo	User category user, group, other, all
+ -=	Add, subtract, or set permissions
rwX	Read, Write, Execute

Numeric Based Permissions

r	w	x	
0	0	0	Value for off
1	1	1	Binary value for on
4	2	1	Base 10 value for on

Octal	Binary	String	Description
0	0	---	No permissions
1	1	--x	Execute only
2	10	-w-	Write only
3	11	-wx	Write and execute (2+1)
4	100	r--	Read only
5	101	r-x	Read and execute (4+1)
6	110	rw-	Read and write (4+2)
7	111	rwX	Read, write, and execute (4+2+1)

Order Has Meaning

	U	G	O
Symbolic	rwX	r-X	r--
Binary	111	101	100
Decimal	7	5	4

Commonly Used Permissions

Symbolic	Octal
<code>-rwx-----</code>	700
<code>-rwxr-xr-x</code>	755
<code>-rw-rw-r--</code>	664
<code>-rw-rw----</code>	660
<code>-rw-r--r--</code>	644

Working with Groups

- New files belong to your primary group.
- The `chgrp` command changes the group.

Directory Permissions Revisited

- Permissions on a directory can effect the files in the directory.
- If the file permissions look correct, start checking directory permissions.
- Work your way up to the root.

File Creation Mask

- File creation mask determines default permissions.
- If no mask were used permissions would be:
 - 777 for directories
 - 666 for files

The umask Command

```
umask [-S] [mode]
```

- Sets the file creation mask to mode, if given.
- Use -S to for symbolic notation.

	Directory	File
Base Permission	777	666
Subtract Umask	-022	-022
Creations Permission	755	644

	Directory	File
Base Permission	777	666
Subtract Umask	-002	-002
Creations Permission	775	664

Octal Subtraction Is an Estimation

	Directory	File
Base Permission	777	666
Subtract Umask	-007	-007
Creations Permission	770	660 *

Common umask modes

- 022
- 002
- 077
- 007

Octal	Binary	Dir Perms	File Perms
0	0	rwX	rw-
1	1	rw-	rw-
2	10	r-X	r--
3	11	r--	r--
4	100	-wX	-w-
5	101	-w-	-w-
6	110	--X	---
7	111	---	---

Special Modes

- umask 0022 is the same as umask 022
- chmod 0644 is the same as chmod 644
- The special modes are:
 - setuid
 - setgid
 - sticky

Summary

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